Seed Storage

Definition

Seed storage may be defined, as the method of conservation of seed, obtained from the harvest until they are planted for successful crop production. The seeds are required to be conserved through proper Storage for a short or long period. During storage of seeds, moisture is controlled properly for the protection of deterioration.

Purpose of Seed Storage

- The purpose of seed storage is to maintain the seed in good physical and physiological condition from the time they are harvested until the time they are planted.
- To protect seed from insect, pest and disease.
- To conserve seeds until they germinate for subsequent crop production.

Importance of seed storage

- It increase crop yield.
- To get adequate plant stands in addition to healthy and vigorous plants.
- It decreases the seed borne disease due to change of local climate at storage.

Condition of storage

- Seed storage aims at maintenance of its germination capacity more stringent condition are require than those to conserve the nutritional or industrial quality of seed.
- During storage, some of the germination capacity is lost slowly or rapidly depending on storage conditions.
- For dry seed storage, the store temperature and moisture will be low at 10°C and relative humidity 50%.

General Principles of Seed Storage

In view of the various factors affecting seed viability in storage, the following principles emerge as necessary for good storage-

1. Seed storage condition should be dry and cool.
2. Effective storage pest control.
3. Proper sanitation in seed stores.
4. Before placing seeds into storage, they should be dried to safe moisture limits, appropriate for the storage system.
5. Storing of high quality seed only, i.e well cleaned, treated as well as of high germination with vigour and good pre-storage history.
6. Determine seed storage needs in view of period or length of storage time, and prevailing climate of the area during storage period.

Stages of Seed Storage

The seeds are considered to be in storage from the moment they reach physiological maturity until they germinate, or until they are thrown away because they are dead or otherwise worthless. The entire storage period can be conveniently divided into following stages.

1. Storage on plants (Physiologically maturity until harvest).
2. Harvest, until processed and stored in a warehouse.
3. In storages (Warehouses).
4. In transit (rail wagons, trucks, carts, railway sheds, etc).
5. In retail stores.
6. On the user's farm.

Storage of Seed on Plants (Physiologically maturity until harvest)

Seeds are considered to be physiologically and morphologically mature when they reach maximum dry weight. At this stage dry down or dehydration of the seed is well underway. Dry down continues after physiological maturity until moisture content of the seed and fruit decreases to a level which permits effective and efficient harvest and threshing. This stage can be termed as harvest maturity. There usually is an interval time between physiological maturity and harvest maturity, and this interval represents the first segment of the storage period. Any delay in harvesting the seed after they reach harvest maturity maturity prolongs the first segment of the storage period.

The seed quality is greatly influence by prevailing environmental conditions; from the time seeds reach physiological maturity until harvest. Weathering damages are often a serious factor at this stage. As a result of weathering damages, seeds of many crops, E. g. Soybean, lose their viability and vigour and are already low in germination even before they are harvested.

Several factors such as soil conditions, mineral nutrient deficiencies, during plant growth, water stress, high or low temperatures, disease and insect damage, etc. may also deteriorate seed quality by reducing viability and vigour at physiological maturity.

Other things being equal, the seeds that have begun to deteriorate due to one or more factors mentioned above subsequently will not store as well as the relatively, undeteriorated seed.

It is therefore, of the utmost importance, to maintain initial seed quality to the near maximum attainable, by keeping weathering and other types of damages to the minimum possible. This would mean raising a good health seed crop, early harvesting and adequate arrangements for seed drying.

Storage from Harvest until Processing

The period of harvesting and cleaning is frequently one of high temperatures. During this time seeds still have high moisture content. Seed deterioration can be rather rapid during this period. Transport from field to threshing floors, threshing floors to processing plants and at the processing plants, involves periods of storage during which deterioration can be rapid and serious, if the moisture content is above 13%. At moisture contents above this range, molds may grow on in the seed end heating may occur.

It is therefore, necessary to take the utmost care in handling of material after harvest. If harvesting has been done above 13% moisture content, necessary arrangements for drying/aeration etc. of seeds are necessary to preserve seed quality. In addition, adequate care is necessary in handling the seed materials at this stage so as to prevent mechanical mixtures and maintain lot identity.

Storage of Seed in Warehouse

It is customary for seed men and others interested in storage of seeds, to give primary attention to rooms or buildings labelled as seed storages. Seed ageing and loss of germination during storage, cannot be stopped altogether, though it could be appreciably reduced by providing good storage conditions. Seed longevity in storage warehouses depends upon a number of factors.

Factors Affecting Seed Longevity in Storage

1. Kind/variety of the Seed: The seed storability is considerably influenced by the kind/variety of seeds. Some kinds are naturally short-lived, e.g. onion, soybeans, peanuts, etc. some similar kinds, e.g. Tall fescue and annual rye grass, though they look very much alike, differ considerably in storability, similarly, the genetic make-up of the lines/varieties in the same kind also influences storability.

2. Initial seed quality: Barton (1941) found that, the seeds of high initial viability are much more resistant to unfavourable storage environmental conditions than low viable seed. Once seed start to deteriorate, it proceeds rapidly. The seed which injured mechanically suffered a lot and loses its viability and vigour very quickly. Generally small seeds escape injury whereas large seeds are more likely to be extensively damaged (e.g. bean, lima-bean and soybean). Spherical seeds usually give more protection than flat or irregularly shaped seeds.

3. Seed moisture content: Most important factor influence the storability. The amount of moisture in the seeds is the most important factor influencing seed viability during storage.

Generally if the seed moisture content increases, storage life decreases. If seeds are kept at high moisture content, the losses could be very rapid due to mould growth. Very low moisture content below 4% may also damage seeds due to extreme desiccation or cause hard seededness in some crops.

Moisture Content and Storage Life of Cereal Seeds at Temperatures not Exceeding 90°F for Seeds of High Germination and High Vigour at Start of Storage (Harrington and Douglas, 1970).

Seed Moisture Content (%)	Storage life
11-13	1/2 year
10-22	1 year
9-11	2 years
8-10	4 years

4. Relative Humidity: Humidity and temperature are the most important factors determining the storage life of seeds. Seeds attain a specific and characteristic moisture content when subjected to given levels of atmospheric humidities. This characteristic moisture content called equilibrium moisture content.

Equilibrium moisture content for a particular kind of seed at a given Relative Humidity tends to increase as temperature decreases. Thus the maintenance of seed moisture content during storage is a function of relative humidity and to a lesser extent of temperature. At equilibrium moisture content, there is no net gain or loss in seed moisture content.

5. Temperature: Temperature also plays an important role in life of seed. Insects and moulds increase as temperature increases. The higher the moisture content of the seeds, the more they are adversely affected by temperature. Decreasing temperature and seed moisture is an effective means of maintaining seed quality in storage. The following thumb rules by Harrington are useful measures for assessing the effect of moisture and temperature on seed storage. These rules are as follows.

i) For every decrease of 1% seed moisture content, the life of the seed doubles. This rule is applicable between moisture content of 5-14%.

ii) For every decrease of 5°C in storage temperature, the life of the seed doubles. This rules applies between 0°C to 50°C.

iii) Good seed storage is achieved when the % of relative humidity in storage environment and the storage temperature is up to 100°F, but the contribution from temperature should not exceed 50°F.

6. Gas during storage

i. Increase in O_2 pressure decrease the period of viability.

ii. N_2 and CO_2 atmosphere will increase the storage life of seeds.

7. Provenance: Generally seeds are harvested in different climate or at different times. So seeds are subjected to different postharvest condition that cause different amount of deterioration by the time seeds are harvested.

8. Effects of Fluctuating Environment Conditions on Viability: There have been a few reports to the effect that fluctuating conditions are harmful.

9. Effect of storage condition on the activity of the organisms associated with seeds in storage: There are 6 main types of organisms associated with storage. They are insect, Fungi, rodents bacteria, birds and mites. The activity of these entire organism lead damage resulting in loss of vigour or viability.